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The Thirty-fifth Annual Report
of the
UNIVERSITY OF MARYLAND

Agricultural Experiment Station



College Park, Prince George County, Maryland

1921-1922

Published by the Station



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THE UNIVERSITY OF MARYLAND

AGRICULTURAL EXPERIMENT STATION

Volume 35

1921-1922

THE THIRTY-FIFTH ANNUAL REPORT OF THE MARYLAND AGRICULTURAL EXPERIMENT STATION

For the Fiscal Year Ending June 30, 1922

By H. J. PATTERSON, *Director*.

*To the Governor of Maryland and the President and
Board of Trustees of the University of Maryland.*

GENTLEMEN:

In accordance with the requirements of the Act of Congress approved March 2, 1887, establishing Agricultural Experiment Stations, I herewith make a report upon the work of the Maryland Agricultural Experiment Station for the fiscal year ending June 30, 1922. This report will endeavor to set before you briefly the character and progress of the investigational work which is being conducted under the provisions and appropriations made by the Federal and State Governments.

SOIL INVESTIGATIONS

This summer will mark the completion of a detailed soil survey of the entire State. It is a source of satisfaction that Maryland, the State in which the Soil Survey work was inaugurated, should be the first to have completed its soil survey. This work was done by this Station in co-operation with the United States Department of Agriculture and the Maryland Geological Survey. The work has covered a period of twenty-two years. The following table gives a summary of the survey in the order in which the work was done:

SUMMARY OF WORK OF THE MARYLAND SOIL SURVEY

<i>Name of County</i>	<i>Date of Survey</i>	<i>Area in Sq. Mi.</i>	<i>Condition of Report</i>
St. Mary's.....	1900	371	Out of print
Calvert	1900	218	Out of print
Cecil	1900	377	Out of print
Kent	1900	282	Out of print
Prince George's.....	1901	482	Out of print
Harford	1901	442	Out of print
Worcester	1903	495	Out of print
Queen Anne's.....	1907	365	Out of print
Talbot	1907	268	Out of print
Caroline	1907	319	Out of print
Anne Arundel.....	1909	432	Out of print
Montgomery	1914	521	Available
Howard	1916	250	Available
Washington	1917	459	Available
Baltimore	1917	650	Available
Carroll	1918	447	Available
Charles	1918	462	Available
Frederick	1919	563	In press
Somerset	1920	331	In press
Allegany	1920	443	In press
Dorchester	1921	576	In press
Wicomico	1921	371	In press
Garrett	1922	685	In press

The total area is approximately 10,000 square miles and has been covered by a detailed survey and mapped on the scale of one inch to the mile. The cost to Maryland of this survey has been less than the amount required to build one mile of concrete road. Chemical analyses are being made of representative samples from each of the important soil types. These analyses, together with information furnished by the survey, will enable the preparation of an inventory of the soil resources of the State. This information can be used as a basis for soil management and fertilizer investigations. Rotation and cropping systems can be revised with regard to the character of the soils and the markets available, and these factors should form the basis for rental contracts, which would be more equitable than those in vogue at present.

The work in testing soils for lime requirement has been continued. This work shows that about seven of every ten acres of tillable land requires application of lime in order to correct acidity or in order to grow most cultivated crops satisfactorily. The information obtained by these lime tests enables the farmers to apply lime in quantities suited to the needs of their soils and also

prevent its use in excessive quantities and where it is not needed at all. In several instances farmers have been saved from expending considerable sums for lime for land which did not require it.

This department has, in co-operation with County Agents and the National Lime Association, in progress about thirty tests in different parts of the State on the relative cost and value of different sources and forms of lime. These tests are planned to cover an entire rotation period.

STAPLE CROP INVESTIGATIONS

About 64 per cent. of the improved land in farms is devoted to the staple crops. The yield of this land represents about 67 per cent. of the total value of all farm crops. The investigations under way may be summarized under the following heads:

1. Variety tests of wheat, corn and soy beans for grain and forage.
2. Improvement of wheat by breeding and selection.
3. Improvement of corn by selection, breeding for yields and disease resistance.
4. Testing the effect of corn and soy beans in a rotation upon the yield of wheat.
5. Tests of rate of seeding, sources of seed and grass and clover mixtures for hay, pastures and lawns, and the effect of fertilization on the elimination of weeds.
6. Testing methods for the control of root rot in sweet corn.
7. The production of Maryland tobacco seed.
8. A study of environment and wheat yields.

It will be noted that these investigations give much prominence to the improvement of the seed. The wisdom of stressing this phase of crop production will be appreciated by all when they consider the important position which the source, character and quality of seed occupies. Maryland farmers use annually nearly one million bushels of seed wheat and over one hundred thousand bushels of seed corn. Only about 10 per cent. of the seed used for these crops would qualify as "certified" under the rules of the Crop Improvement Association. In consequence of the failure of the farmers to use a high quality of seed, the yield and quality of the crops produced have a much lower value than they should. This means that the farmers of Maryland are not receiving as much as is possible for the labor and expenses incurred in growing wheat and corn. Much attention is being given to the eradication of garlic both in seed and by culture. Nearly 95 per cent. of wheat grown in Maryland contains some garlic. This causes a heavy annual loss in commercial value.

SEED INSPECTION

The number of samples of seed sent in for examination would seem to indicate that farmers are demanding higher quality in seeds and are appreciating the service which this laboratory can render.

It is very desirable that the information concerning the quality of seed be given before it is planted rather than some months after. The laboratory is now co-operating with some dealers in an effort to work out some feasible plan of inspection towards this end.

There is need for much research on the methods for determining the germination of seeds.

HORTICULTURAL INVESTIGATIONS

Small Fruits—The following is a list of the investigations in progress on small fruits:

1. A physiological study of grape pruning.
2. Grape breeding.
3. Testing new varieties of strawberries.
4. Variety tests of bush fruits.
5. Tests of fertilizers for strawberries.

The late frosts during 1921 and 1922 injured the crops of all small fruits to such an extent that no comparative results of value could be obtained.

Orchard Fruits—The following investigations relating to orchard fruits are in progress:

1. The production of apple stocks by cuttings.
2. Testing apple varieties.
3. Apple breeding.
4. Apple pollination.
5. Pear breeding.
6. Peach, plum and cherry variety tests.
7. Studies in biennial bearing of the apple.
8. Pruning and nitrogen tests in rejuvenating a peach orchard.
9. Effect of shade on fruiting habits and vegetative development of some horticultural plants.
10. A comparison of the relative value and time of application of nitrate of soda and ammonium sulphate on peaches and apples.

Vegetable Gardening—The investigations in progress with vegetables can be summarized under the following heads:

1. A physiological study of onion dormancy.
2. A study of fertilizers for sweet potatoes.
3. Factors influencing the vegetation and reproduction of bunch onions grown from sets.
4. Time of formation of Flower Primordia in the onion.
5. Chemical changes in the onion under various storage conditions.

6. A study of the chemical and physiological changes in the parsnip as affected by different storage conditions.
7. Fertilizers for tomatoes for the production of an early crop.
8. Correlation of the development of the sweet potato tuber to vine growth, temperature and moisture.
9. A study of the influence of temperature on the growth of peas.
10. A study of Maryland vegetables as to varieties, cultural methods and marketing.
11. The effect of fertilizers on plant variation.
12. Seed saving for adaption and disease resistance.
13. Improvement of the McCormick potatoes by hill selection and seeds.
14. What amount of fertilizers and manures is it necessary to apply in order to keep soil fertile for truck crops.
15. Testing vegetable novelties.
16. Improvement of the tomato for canning purposes.
17. Fertilizer requirements for asparagus.
18. Conserving the fertility of trucking soils during winter.
19. Value of rye when turned down as a fertilizer for truck crops.
20. A study of the causes of fall-planted cabbage going to seed before heading in the spring.
21. Value of cow peas and soy beans in adding humus to soil, compared with clover sod.
22. Value of chemical fertilizers in rhubarb.
23. Value of ground limestone compared with hydrated lime in the flocculation of the soil particles and its relation to the germination of vegetable seeds.
24. Time of planting late potatoes.
25. Factors affecting the growth of the garden pea as a canning crop.
26. Stable manure versus chemical fertilizers for cantaloupes.
27. Best source of potash in complete chemical fertilizer for vegetable growing.
28. Localities for and methods for production of cabbage seed.

The results of many of these will have progressed sufficiently to warrant giving the results in bulletin form during the coming year. There are many other horticultural problems which call for investigation, but time and funds will not permit them to be taken up until some of the present projects are completed.

Floriculture—

1. A study of means for procuring seed of the ten-week stock to produce a large per cent of double flowers.
2. A study of some of the causes of the bursting of the carnation calyx, with special reference to its inherited characters.
3. Testing the relation of seed environment to winter bloom of sweet peas.
4. Testing the effect of artificial light on flowering plants in the green house.
5. Some pruning experiments on green-house roses.
6. Trial gardens of the American Dahlia Garden Society.

Much of the work in the floricultural department has progressed sufficiently to give valuable results. These results will soon be given in bulletin form.

PLANT PHYSIOLOGY

The storage of cereals, vegetables and fruits in fresh or living condition for use as food or seed is becoming more and more important as the area for their distribution increases and the population becomes more concentrated in towns and cities. The economical use of these products requires that they be stored for longer periods of time and drawn on gradually for consumption. The successful storage of these products is of much economic importance in determining the price received by the producer and the cost to the consumer. The following investigations being pursued in the department of Plant Physiology are concerned in solving these storage problems:

1. The spindling sprout of the potato tuber.
2. The chemical and physical behavior of potatoes in the ground after death of the vines.
3. Regeneration in potato tubers.
4. Metabolism studies with sweet corn.
5. Physiological aspects of fruit forage.
6. Physiological and biochemical aspects of potato storage.
7. The mineral nutrient requirements of the potato plant.
8. A study of the behavior of fruit buds and twigs on hardness of the peach.

PLANT DISEASE AND BOTANICAL INVESTIGATIONS

The breeding or selection of disease resistant varieties or strain of crops is yielding promising results. Work of this nature is now in progress with tomatoes, cabbage, peas and corn. Investigations have been continued with corn-root rot, pea-root rot, *Sclerotinia* fruit rot, brown rot, twig and branch cankers. The botanical laboratory has continued as opportunity presented the identification and study of Maryland grasses, trees, weeds and other plants. Much information has been accumulated on some of these subjects which will soon be published in a bulletin.

ENTOMOLOGY-INSECT CONTROL

The importance of protecting crops, fruits and animals against insect ravages is apparent in some form every year. New problems are constantly arising. The Station entomologists have given attention the past year to the following investigations:

1. The control of the boxwood leaf miner.
2. The control of the chrysanthemum gall midge.
3. The control of mealy bug, red spider, thrips, aphids and scales in the green house.
4. Tests of new insecticides.
5. Comparison of spraying and dusting for the control of pea aphids and other truck crops.
6. The winter protection of bees.
7. The biology and control of the peach-tree borer.

8. The chemical, physical and insecticidal properties of pine tar creosotes and some allied products.
9. The biology and control of the corn-ear worm and its ravages on string beans.
10. A study of spray injury by lime-sulphur.
11. Tests of methods for the control of European Red Mites.
12. Survey and collection of insects of the State.

RIDGELY SUB-STATION

The Ridgely High School farm was transferred to the Experiment Station for use as a Sub-Station in 1915. The farm consists of about fifty acres of tillable land, representing mostly the Sassafras soil types. The silt phase of this type of soil is commonly called White Oak, and generally it is rather poorly drained and somewhat difficult to manage. This condition which prevails on a part of this farm is being gradually corrected by tile draining. The fall is small and the tile cannot be placed as deep as is desirable for best results. Almost the entire farm is devoted to experimental work. The principal tests in progress at Ridgely are:

1. The use of fertilizers in a rotation of corn, wheat, hay and tomatoes.
2. The effect of lime with and without fertilizers and manure.
3. Tests of varieties of tomatoes and early plants on total yield.
4. Tests with late potatoes—varieties, size of seed, and fertility.
5. Experiments with garden peas for canning and market.
6. Experiments with sweet potatoes, eggplants, peppers and cantaloupes.
7. Variety tests of corn, wheat and soy beans.
8. Tests of new selections of wheat.
9. Growing multiplication plot of Mammoth Red Wheat for distribution.
10. Variety and fertilizer tests of strawberries.
11. Tests of different kinds of lime on alfalfa.

ANIMAL HUSBANDRY

The increase in the appropriations made for investigational work will permit renewing the activity of some of the projects in Animal Husbandry which have been dormant for several years and inaugurating some new investigations in this field. Some investigations cannot be undertaken, as the facilities at hand are not adequate and satisfactory arrangements cannot be made for the work elsewhere. New quarters for the animal disease investigations have been secured. This will permit the use of the present hog plant for general investigational work.

DAIRY HUSBANDRY

More funds have been provided for this class of work during the next fiscal year. This will enable the Station to investigate

some of the many problems that are bothering the dairy farmer. Maryland is most concerned in producing market milk for city consumption. This phase will receive first consideration, but problems will also be taken up to determine if some kind of dairying might prove of advantage to sections not favorably located for shipping milk to the cities or provided with a local market.

The investigations outlined in the former reports are still in progress.

BIOLOGICAL AND ANIMAL PATHOLOGY DEPARTMENT

The principal investigations receiving attention during the past year deal with the duration of immunity in hogs to cholera and the susceptibility of young pigs to this disease. A good deal of data has been collected on each of these projects during the past year. They are both progressing as rapidly as space and material at command will permit.

A project on Pyocaneous infection in the udders of cows has been completed. This will be prepared for publication at an early date.

The hog cholera projects will be continued, and during the coming year it is planned to undertake some rather extensive experiments with Ozone.

This laboratory has prepared and sent out to farmers through the County Agricultural Agents 2,886 tubes of *Legume Inoculum*. This is sufficient for 2,233 acres. Most of this was for alfalfa and soy beans, but some was prepared for cow peas, sweet clover, garden peas, vetch, red clover and crimson clover.

This laboratory also prepared and distributed 38,173 c.c. *Tuberculin*.

There was also distributed through this laboratory 476,075 c.c. hog cholera serum and 2,208 c.c. virus. The laboratory had 421 specimens for diagnosis during the year.

POULTRY HUSBANDRY

The relatively large returns received from poultry, as compared with other farm activities, during the past year has caused a largely increased interest in the industry. This condition has greatly increased the correspondence, requests for visits and advice in all forms. The poultry department has co-operated closely with the newly formed Maryland Poultry Association. There has been issued from this department, besides the regular bulletins, three circulars—one on culling the flock, one on the use of artificial light in the poultry house, and one on Epsom salts for poultry.

The investigation on whole vs. cracked corn has been completed and shows decidedly in favor of the use of whole corn.

The following poultry investigations are now in progress:

1. Limestone grit vs. oyster shells.
2. Appliances and methods.
3. The effect of fish scrap on the flavor of eggs.
4. A study of the accuracy of methods of determining promising layers.

PUBLICATIONS

The following bulletins were issued during this fiscal year:

1921	Number	Subject	Author	No. Pages
July		The Thirty-fourth Annual Report.....	H. J. Patterson...	19
August	244	Poultry Experiments, Observations, Notes and Plans	R. H. Waite.....	40
September	245	The Seasonal March of the Climatic Conditions of a Green-house as Related to Plant Growth	E. S. Johnston....	58
1922				
March	246	Garlic and Other Factors Influencing Grades of Wheat	J. E. Metzger....	18
February	247	Fertilizers for Maryland Soils	A. G. McCall....	36
February	248	Tomatoes for Market and Canning	H. A. Jones.....	36
June	249	Seed Inspection for 1921.	F. S. Holmes....	20
June	250	The Influence of Various Systems of Grape Training on Fruit Production	E. C. Auchter and W. R. Ballard....	28

These bulletins were issued in editions varying from 3,500 to 22,000. They were sent out, depending upon the subject, either to special or the general mailing lists.

The money available for printing does not permit issuing bulletins as promptly or in as large editions as is desirable.

The bulletins issued during the past year make a volume of 234 pages and they are appended herewith as a part of this Annual Report.

Besides these bulletins, the members of the staff have contributed numerous popular articles to the agricultural press and many technical papers to scientific meetings and journals.

FINANCES

The following statements will give the details as to the receipts and expenditures of the Experiment Station appropriations during the past year.

The making of purchases through a Central Purchasing Agency has caused much and in some instances serious delay in procuring supplies. The very nature of investigational work makes it impossible to foresee needs three to six months in advance. When new problems come up it is highly desirable to be able to procure material and facilities for their investigation at once, for the opportunity to do the work may pass for months or even forever in a few hours. The delays and difficulties encountered in procuring supplies is drafting on the energy and initiative of investigators. This is a condition to which this class of men and work should not be subjected.

The appropriations for maintenance for the State fiscal year beginning October, 1922, was made in one lump sum and is not circumscribed by the details of a budget which obtained in the past. This greater latitude will prove very helpful in meeting the changing needs and markets.

FINANCIAL STATEMENT

MARYLAND AGRICULTURAL EXPERIMENT STATION

IN ACCOUNT WITH

UNITED STATES APPROPRIATIONS

	<i>Hatch Fund</i>	<i>Adams Fund</i>
DR.		
To appropriations for fiscal year 1921-1922.....	\$15,000.00	\$15,000.00
CR.		
By Salaries	\$13,183.12	\$12,929.22
Labor	853.18	130.00
Publications	578.88	.....
Postage and Stationery.....	8.14	24.30
Freight and Express.....	.....	159.86
Heat, Light, Water and Power.....	196.31	932.89
Chemicals and Laboratory Supplies.....	12.77	407.33
Seeds, Plants and Sundry Supplies.....	102.78	51.97
Library	27.88	2.88
Tools, Machinery and Appliances.....	.60	2.95
Scientific Apparatus and Specimens.....	36.34	279.54
Furniture and Fixtures.....	.....	12.91
Traveling Expenses .....	.....	51.01
Contingent Expenses .....	.....	1.20
Buildings and Land.....	.....	13.94
Totals.....	\$15,000.00	\$15,000.00

MARYLAND AGRICULTURAL EXPERIMENT STATION

IN ACCOUNT WITH

THE STATE APPROPRIATIONS

DR.	<i>General Fund</i>	<i>Ridgely Farm</i>
Balance June 30, 1921.....		\$1,388.80
Receipts for year 1921-1922.....	\$43,980.12	5,643.55
	<hr/>	<hr/>
Totals.....	\$43,980.12	\$7,032.35
CR.		
By Salaries	\$17,337.15	\$1,960.00
Labor	8,492.93	1,229.07
Publications	3,813.60	694.99
Postage and Stationery.....	591.79	40.08
Freight and Express.....	971.65	35.13
Heat, Light, Water and Power.....	828.87	7.70
Chemicals and Laboratory Supplies.....	181.36	67.94
Seeds, Plants and Sundries.....	668.24	293.94
Fertilizers	558.68	274.49
Feeding Stuffs	3,212.20	.....
Library	310.20	.....
Tools, Machinery and Appliances.....	1,191.16	53.33
Furniture and Fixtures.....	165.04	.....
Scientific Apparatus and Specimens.....	517.05	62.27
Live Stock	500.00	.....
Traveling Expenses	979.78	286.50
Contingent Expenses	447.00	2.00
Buildings and Land.....	1,955.26	706.51
Balance Transferred to Station Farm.....	1,258.16	141.04
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Totals.....	\$43,980.12	\$5,851.99
Credit Balance June 30, 1922.....	1,177.36
	<hr/>	<hr/>
	\$43,980.12	\$7,032.35

MARYLAND AGRICULTURAL EXPERIMENT STATION
STATION FARM ACCOUNT

DR.

Receipts from sales for year 1921-1922..... \$15,109.58

CR.

By Salaries	\$199.97
Labor	13,789.13
Freight and Expenses.....	444.12
Heat, Light, Water and Power.....	401.15
Seeds, Plants and Sundry Supplies.....	251.05
Feeding Stuffs	2,000.70
Library	5.75
Tools, Machinery and Appliances.....	63.87
Traveling Expenses	634.67
Contingent Expenses	137.85
Buildings and Land.....	67.74
	\$17,996.00
Overdraft June 30, 1921.....	5,480.31
	\$23,476.31
Total.....	\$23,476.31
Overdraft June 30, 1922.....	\$8,366.53

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